SPRING 2005

STANDARDS AND GUIDELINES

FOR

CONTAMINANTS IN MASSACHUSETTS DRINKING WATERS

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection
Office of Research and Standards
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TO: Interested Parties

FROM: Carol Rowan West, Director, Office of Research and Standards

DATE: ***Spring 2005***

RE: Massachusetts Drinking Water Standards and Guidelines

Attached is the latest list of the Massachusetts Drinking Water Standards and Guidelines. The last issue was sent out in May of 2004.

There are several clarifications and/or updates to the list from its last edition. These include a units correction for the radon guideline, a clarification of the current status of the perchlorate guideline and the addition of clarifying language to the footnotes for acrylamide and epichlorohydrin to better describe the criteria that the treatment technique must meet. In addition, please note that the current MMCL for arsenic of 0.05 mg/L will become 0.01 mg/L as of 1/23/06 and thus will go into effect prior to publication of Massachusetts' Spring 2006 list. Finally, the 2005 list has undergone a slight formatting change to establish separate lists for biological contaminants and radionuclides.

For contaminant concentration limits for drinking water to be termed standards, or Massachusetts Maximum Contaminant Levels (MMCL) in Massachusetts, one of two events must occur. Either the promulgated EPA Maximum Contaminant Levels (MCLs) printed in the Federal Register must be formally adopted by the Drinking Water Program (DWP) at the Department of Environmental Protection (DEP) or the date listed in the Federal Register for the MCLs to be effective must have passed.

The standards and guidelines may not apply to all contaminant situations, so I urge you to continue to contact the Office of Research and Standards (ORS) with any questions regarding the application or interpretation of this information. Also, when a contaminant of interest is not on the list, please contact ORS for guidance (phone number 617-292-5998; email: michael.hutcheson@state.ma.us). The list can be accessed from the Massachusetts Department of Environmental Protection (MADEP) Web Page at http://www.mass.gov/dep/water/laws/regulati.htm#dw

I. Introduction

The Drinking Water List of Standards and Guidelines is a convenient compendium of guidance values available for evaluating contaminants in drinking water in Massachusetts. The list is designed to be used by individuals or groups concerned with the integrity of drinking water, for example, water suppliers, homeowners, environmental groups, government regulators, boards of health, or private consultants.

Under the Safe Drinking Water Act (SDWA), a State may be granted primacy for implementing the provisions of the SDWA. MADEP has primacy for implementation. As part of that primacy, MADEP is responsible for ensuring the quality of Massachusetts public drinking waters.

The Office of Research and Standards is charged with establishing protective public health standards and/or guidelines for contaminants in drinking water. This mission may involve adoption or revision of standards established by the EPA, or ORS may adopt a more stringent standard or guideline based on an independent review of primary or secondary data.

II. Standards

The Massachusetts MCLs listed in the drinking water regulations (310 CMR 22.00), as well as the promulgated MCLs set by the EPA which have become effective, constitute the Massachusetts Drinking Water Standards, which are listed as MMCLs on the Drinking Water List. The standards are enforced by the Drinking Water Program (DWP). The drinking water regulations have been updated to reflect the latest changes in the drinking water standards. The regulations were last promulgated in April 2004.

The MMCLs listed in 310 CMR 22.00 apply to water that is delivered to any user of a public water system as defined in 310 CMR 22.02. Please refer to the regulations for more specific definitions and applications. Private residential wells are not subject to the requirements of 310 CMR 22.00. However, these drinking water standards are recommended for the evaluation of private drinking water and are often used to evaluate private residential contamination, especially in Federal Superfund and M.G.L Chapter 21E activities.

III. Guidelines

The Office of Research and Standards of the MADEP issues guidance for chemicals other than those with Massachusetts MCLs in drinking water. Standards promulgated by the EPA but not yet effective may be included on the Guidelines list.

ORS derives guidelines and recommends or revises EPA Health Advisories (HA; available at http://www.epa.gov/ost/drinking/standards/dwstandards.pdf) and Proposed Maximum Contaminant Levels (PMCLs) after review and evaluation of all available data for a particular contaminant. All new health advisory guidelines are evaluated on an ongoing, case-by-case basis and may be incorporated into the list.

ORS uses methodology similar to that used by the EPA's Office of Groundwater and Drinking Water (OGWDW) when setting guidelines for chemicals in drinking water. Concentrations of chemicals having evidence of carcinogenicity are minimized as much as feasible; therefore, guidelines are set at a target risk of one in one million or at the lowest practical quantitation limit (PQL) if the concentration at 1×10^{-6} is below the PQL. This practice applies to chemicals classified as A or B carcinogens under the old cancer classification scheme of EPA (US EPA, 1986). Class C carcinogens are individually evaluated for a decision regarding whether to set the guidelines on cancer effects. For newly classified carcinogens under EPA's new Carcinogen Risk Assessment Guidelines (US EPA, 2005), MADEP will follow EPA OGWDW's procedures for development of guidance.

To derive guidance for potential non-carcinogenic effects for a chemical, ORS applies a percentage (usually 20%) to published or derived route-specific reference doses and then uses standard exposure assumptions to convert the dose to a drinking water concentration. This practice allows for the possibility of human exposures from sources other than drinking water.

The standards and guidelines published in this list are derived for the specific circumstances associated with drinking water. The assumptions used in establishing the numbers are therefore specific to drinking water situations and discretion must be exercised when using the guidance for situations other than contaminated drinking water. Please refer any questions regarding the proper use of the numbers issued in this list to the Office of Research and Standards at 617-292-5998.

A more detailed description of the methodology used by ORS to derive water guidance can be found in Guide to the Regulation of Toxic Chemicals In Massachusetts Waters (ORS 1990), available on MADEP's website at: http://www.mass.gov/dep/water/laws/policies.htm#dwguid.

IV. Spring 2005 Drinking Water Standards and Guidelines Lists Update

Changes to the 2005 List

Contaminant	Description of Change	Basis for Change
Acrylamide	Clarifying language was added to the footnote to better describe the standards the treatment technique must meet.	While the existing footnote specifies that the MCL for this chemical is a treatment technique, it does not specify the criteria by which compliance with this standard is achieved. The revised footnote specifies that when acrylamide and epichlorohydrin are used in drinking water systems, each water system must certify in writing that the combination of dose and monomer level of these chemicals does not exceed specified levels. See footnote for these chemicals in the list of Massachusetts Drinking Water Standards for details.
Epichlorohydrin	Clarifying language was added to the footnote to better describe the standards the treatment technique must meet.	While the existing footnote specifies that the MCL for this chemical is a treatment technique, it does not specify the criteria by which compliance with this standard is achieved. The revised footnote specifies that when acrylamide and epichlorohydrin are used in drinking water systems, each water system must certify in writing that the combination of dose and monomer level of these chemicals does not exceed specified levels. See footnote for these chemicals in the list of Massachusetts Drinking Water Standards for details.
Perchlorate	Footnote updated to reflect current status of this guideline.	MADEP will soon propose an MMCL for perchlorate that will be available for public comment. The current status of this guideline can be obtained by checking the MADEP's website at http://www.mass.gov/dep/water/drinking/percinfo.htm. The Spring 2006 drinking water list will show the final MMCL.
Radon	Guideline expressed in units of picoCurie per liter (pCi/L)	The units for this radionuclide were inadvertently omitted in the 2004 list and thus it incorrectly appeared that this guideline was expressed in the default units of mg/L appearing in the column heading.

V. References

Office of Research and Standards, 1990. *Guide to the Regulation of Toxic Chemicals in Massachusetts Waters.* Department of Environmental Protection. Boston, MA.

USEPA (U.S. Environmental Protection Agency). 2005. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F. Risk Assessment Forum. U.S. Environmenal Protection Agency. Washington, D.C.

USEPA (U.S. Environmental Protection Agency). 1986. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum. U.S. Environmental Protection Agency. Washington, D.C.

MASSACHUSETTS DRINKING WATER STANDARDS – Inorganic and Organic Chemicals

Please note that drinking water guidance is contained in five separate lists, in the following order:
(1) Massachusetts Maximum Contaminant Levels – Inorganic/Organics; (2) Massachusetts Maximum Contaminant Levels – Radionuclides;
(3) Massachusetts Maximum Contaminant Levels – Biologicals; (4) Massachusetts Drinking Water Guidelines;
(5) Secondary Maximum Contaminant Levels

SUBSTANCE	CASRN	MMCL (mg/L)
Acrylamide[1]	79061	Treatment Technique
Alachlor	15972608	0.002
Antimony	7440360	0.006
Arsenic[2]	7440382	0.05
Asbestos[3]	1332214	7 million fibers/liter
Atrazine	1912249	0.003
Barium	7440393	2
Benzene	71432	0.005
Benzo(a)pyrene	50328	0.0002
Beryllium	7440417	0.004
Bromate	15541454	0.010
Cadmium	7440439	0.005
Carbofuran	1563662	0.04
Carbon tetrachloride	56235	0.005
Chloramines (as Cl_2)	N/A	4.0 (MRDL[4])
Chlordane	57749	0.002
Chlorine (as Cl_2)	7782505	4.0 (MRDL)
Chlorine dioxide (as ClO_2)	10049044	0.8 (MRDL)
Chlorite	7758192	1.0
Chlorobenzene	108907	0.1
Chromium (total)	7440473	0.1
Copper	7440508	Treatment Technique, 1.3 (Action Level)
Cyanide (as free cyanide)	57125	0.2
2,4-D (2,4-Dichlorophenoxyacetic acid)	94757	0.07

MASSACHUSETTS DRINKING WATER STANDARDS – Inorganic and Organic Chemicals

SUBSTANCE	CASRN	MMCL (mg/L)
Dalapon	75990	0.2
1,2-Dibromo-3-chloropropane (DBCP)	96128	0.0002
1,2-Dichlorobenzene (o-DCB)	95501	0.6
1,4-Dichlorobenzene (p-DCB)	106467	0.005
1,2-Dichloroethane	107062	0.005
1,1-Dichloroethylene	75354	0.007
1,2-Dichloroethylene(*cis*)	156592	0.07
1,2-Dichloroethylene(*trans*)	156605	0.1
Dichloromethane	75092	0.005
1,2-Dichloropropane	78875	0.005
Di(2-ethylhexyl)-adipate	103231	0.4
Di(2-ethylhexyl)-phthalate	117817	0.006
Dinoseb	88857	0.007
Diquat	85007	0.02
Endothall	145733	0.1
Endrin	72208	0.002
Epichlorohydrin[5]	106898	Treatment Technique
Ethylbenzene	100414	0.7
Ethylene dibromide (EDB)	106934	0.00002
Fluoride	7782414	4.0
Glyphosate	1071536	0.7
Haloacetic acids (HAA5) (for chlorinated supplies only): including monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, bromoacetic acid and dibromoacetic acid	N/A	0.060
Heptachlor	76448	0.0004

SUBSTANCE	CASRN	MMCL (mg/L)
Heptachlor epoxide	1024573	0.0002
Hexachlorobenzene	118741	0.001
Hexachlorocyclopentadiene	77474	0.05
Lead	7439921	Treatment Technique, 0.015 (Action Level)
Lindane	58899	0.0002
Mercury (inorganic)	7439976	0.002
Methoxychlor	72435	0.04
Nitrate (As N)	14797558	10
Nitrate/Nitrite (total)	N/A	10
Nitrite (As N)	14797650	1
Oxamyl (Vydate)	23135220	0.2
PCBs (Polychlorinated biphenyls)	1336363	0.0005
Pentachlorophenol	87865	0.001
Picloram	1918021	0.5
Selenium	7782492	0.05
Simazine	122349	0.004
Styrene	100425	0.1
2,3,7,8-TCDD (Dioxin)	1746016	3×10^{-8}
Tetrachloroethylene	127184	0.005
Thallium	7440280	0.002
Toluene	108883	1
Total trihalomethanes (for chlorinated supplies only)	N/A	0.08
Including: Chloroform	67663	N/A[6]
Chlorodibromomethane	124481	N/A
Bromodichloromethane	75274	N/A
Bromoform	75252	N/A

MASSACHUSETTS DRINKING WATER STANDARDS – Inorganic and Organic Chemicals

SUBSTANCE	CASRN	MMCL (mg/L)
Toxaphene	8001352	0.003
2,4,5-TP (Silvex)	93721	0.05
1,2,4-Trichlorobenzene	120821	0.07
1,1,1-Trichloroethane	71556	0.2
1,1,2-Trichloroethane	79005	0.005
Trichloroethylene	79016	0.005
Vinyl chloride	75014	0.002
Xylenes (total)	1330207	10

[1] No numerical MCL is provided for these compounds. If detected, a treatment technique is specified. Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

- Acrylamde = 0.05% dosed at 1 mg/L (or equivalent)
- Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

[2] The MCL for arsenic was changed in 2001 and will become effective at 0.01 mg/L as of 1/23/06 following Implementation Guidance issued in August 2002.

[3] For fibers longer than 10 microns.

[4] MRDL = maximum residual disinfectant level - the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

[5] See footnote 1 above.

[6] Not applicable

Please note that drinking water guidance is contained in five separate lists, in the following order:
(1) Massachusetts Maximum Contaminant Levels – Inorganic/Organics; (2) Massachusetts Maximum Contaminant Levels – Radionuclides;
(3) Massachusetts Maximum Contaminant Levels – Biologicals; (4) Massachusetts Drinking Water Guidelines;
(5) Secondary Maximum Contaminant Levels

SUBSTANCE	CASRN	TYPE OF GUIDANCE	MMCL or ORSG (mg/L)
Beta particle and photon radioactivity	N/A	MMCL	concentration which produces an annual dose of 4 millirem/yr
Gross alpha radiation	N/A	MMCL	15 pCi/l
Radium (226 + 228)	7440144	MMCL	5 pCi/l
Radon-222[1]	14859677	ORSG	10,000 pCi/l
Uranium	7440611	MMCL	0.03

[1] Exceedance of this guideline indicates that air sampling for Radon-222 should be done. EPA proposed guidelines for radon (64 FR 211; Tuesday, November 2, 1999) which have not been finalized.

MASSACHUSETTS DRINKING WATER STANDARDS – Biologicals

Please note that drinking water guidance is contained in five separate lists, in the following order:
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(3) Massachusetts Maximum Contaminant Levels – Biologicals; (4) Massachusetts Drinking Water Guidelines;
(5) Secondary Maximum Contaminant Levels

SUBSTANCE	CASRN	MMCL
Cryptosporidium	N/A	Treatment Technique
Giardia lamblia	N/A	Treatment Technique
Heterotrophic plate count	N/A	Treatment Technique
Legionella	N/A	Treatment Technique
Total coliform bacteria (including fecal coliform and *E. coli*)	N/A	refer to 310 CMR 22.05
Turbidity	N/A	Treatment Technique
Viruses (enteric)	N/A	Treatment Technique

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SUBSTANCE	CASRN	ORSG (mg/L)
Acetone	67641	6.3
Aldicarb[1]	116063	0.003
Aldicarb sulfone[2]	1646884	0.002
Aldicarb sulfoxide[3]	1646873	0.004
Bromomethane	74839	0.01
Chloroform[4]	67663	0.07
Dichlorodifluoromethane	75718	1.4
1,1-Dichloroethane	75343	0.07
1,3-Dichloropropene	542756	0.0004
1,4-Dioxane	123911	0.003
Ethylene glycol	107211	14
Methyl ethyl ketone	78933	4.0
Methyl isobutyl ketone	108101	0.35
Methyl *tertiary* butyl ether[5]	1634044	0.07
Metolachlor	51218452	0.1
Naphthalene	91203	0.140
Nickel[6]	7440020	0.1
n-Nitrosodimethylamine (NDMA)	62759	0.00001
Perchlorate[7]	Various CASRN numbers for different chemical species	0.001

SUBSTANCE	CASRN	ORSG (mg/L)
Petroleum hydrocarbons[8]	N/A	
TPH		0.2
Aliphatics		
C_5-C_8		0.3
C_9-C_{12}[9]		0.7
C_9-C_{18}[10]		0.7
C_{19}-C_{36}		14.0
Aromatics		
C_6-C_8		use guidance for individual chemicals
C_9-C_{10}		0.2
C_{11}-C_{22}		0.2
Sodium[11]	7440235	20
Tetrahydrofuran	109999	1.3
1,1,2-Trichloro-1,2,2-trifluoroethane (FREON 113)	76131	210

All guidelines are current with the information listed in IRIS as of March 23, 2005, except where noted.

[1] The MCLs for aldicarb, aldicarb sulfone and aldicarb sulfoxide have been stayed.
[2] See footnote 1 above.
[3] See footnote 1 above.
[4] This guideline applies to non-chlorinated water supplies. For chlorinated drinking water supplies, please contact the Drinking Water Program.
[5] The health-based guideline for MTBE was reviewed by ORS in 2000.
[6] The MCL for Nickel has been remanded and is no longer in effect, however the current EPA IRIS chronic oral reference dose for soluble salts of nickel (http://www.epa.gov/iris/subst/0271.htm) supports this value and it is also the currently listed EPA Life-time Health Advisory value (http://www.epa.gov/ost/drinking/standards/dwstandards.pdf).
[7] This interim guidance is directed at the sensitive subgroups of pregnant women, infants, children up to the age of 12, and individuals with hypothyroidism. They should not consume drinking water containing concentrations of perchlorate exceeding 1 µg/L. MA DEP recommends that no one consume water containing perchlorate concentrations greater than 18 µg/L. MADEP will soon propose an MMCL for perchlorate that will be available for public comment. The current status of this guideline can be obtained by checking the MADEP's website at http://www.mass.gov/dep/water/drinking/percinfo.htm. The Spring 2006 drinking water list will show the final MMCL.
[8] Monitoring for these compounds is not required but is done on a case-by-case basis. These limits may be used when evaluating health risks posed by clearly identified mixtures of petroleum hydrocarbon compounds. The analytical methods to use to generate data to compare to the Drinking Water Guidelines are the Volatile Petroleum Hydrocarbon (VPH) and the Extractable Petroleum Hydrocarbon (EPH) methods developed by the MADEP (MADEP 1998).
[9] The overlap in the C9-C12 range is the result of the VPH and EPH analytical methods used to quantitate these ranges of petroleum hydrocarbons in drinking water. The choice of the most appropriate range to use is based on the identity of the petroleum product of concern and is therefore determined on a case-specific basis.
[10] See footnote 9 above.
[11] All detections of sodium must be reported. Please refer to 310 CMR 22.06A for the specific requirements. The sodium guideline of 20 mg/L is based on an eight (8) ounce serving.

SECONDARY MAXIMUM CONTAMINANT LEVELS

Please note that drinking water guidance is contained in five separate lists, in the following order:
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(5) Secondary Maximum Contaminant Levels

Chemicals/Parameter	Status	SMCL (mg/L)
Aluminum	F[1]	0.05 to 0.2
Chloride	F	250
Color	F	15 Color Units
Copper	F	1
Corrosivity	F	non-corrosive
Fluoride	F	2
Foaming agents	F	0.5
Iron	F	0.3
Manganese	F	0.05
Methyl *tertiary* butyl ether[2]	A[3]	0.020-0.040
Odor	F	3 threshold odor numbers
pH	F	6.5 - 8.5
Silver	F	0.10
Sulfate	F	250[4]
Total dissolved solids (TDS)	F	500
Zinc	F	5

Secondary Standards are referenced in the Massachusetts Drinking Water Regulations (310 CMR 22.07 (d)).

[1] Final
[2] The secondary MCL for MTBE is based on the Drinking Water Advisory set by EPA and is based on taste and odor considerations.
[3] Advisory
[4] An MCL of 500 mg/L has been proposed by USEPA (Federal Register 12/20/94).